Dam ID: HI-00012
Kapaia Reservoir

Vulnerability Index:
Extreme 1 | High 2 | Moderate 3 | Low 4

Inspection No:
Date: 3/20/2006

STATE OF HAWAII - DLNR
VISUAL DAM SAFETY INSPECTION SHEET

Inspection Type: Visual Dam Safety Inspection

Persons Present	Affiliation	Phone Number
Henri Mulder	Corps of Engineers	
Al Satogata	DLNR	
Craig Koga	DLNR	
Galen Kawakami	DLNR	
Max Manera	AJAR	
Adam Killerman	AJAR	

Weather Condition: ☐ Rain previous day ☐ Rainy ☐ Drizzle / Mist ☐ Cloudy/Overcast ☐ Partly Cloudy x Sunny x Dry

Comments:

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1. General: *(Information currently on file, update as required)*

Dam/Res. Name: Kapaia
Owner: Grove Farm Company
Owner Contact: Adam Killerman — Owner Ph.:
Lessee: — Lessee Ph.:
O & M Contractor: AJAR, Inc. Adam Killerman — O & M Ph.:
Nearest City: Kapaia — Latitude: 22° 1.2' ° (decimal)
County: Kauai — Longitude: 159° 23.9' ° (decimal)
Tax Map Key(s):

Dam Status	A	Hazard Potential	L	Dam Size	
Year Completed	1910	Dam Length	1050 ft.	Dam Height	45 ft.
Normal Storage	1105 ac.ft.	Max. Storage	1114 ac.ft.	Max. Surface Area	ac.
Offsite Drainage Area	mi.	Spillway Type		Max. Spillway Q	cfs

Owner owns land under dam facility:
Emergency Action Plan on file with the Department: No
Reports on file with the Department:

2. Questions for Owner's Rep.:	Yes	No	Unknown	Comments
Construction Plans Available	☐	☐	☐	
Site / Facility Map	☐	☐	☐	
Operation & Maintenance Manual	☐	☐	☐	
Emergency Action Plan	☐	☐	☐	
Modifications / Improvements	☐	☐	☐	
Conduct Routine Inspections	☐	☐	☐	
Conduct Routine Maintenance	☐	☐	☐	
Vehicle access to site	x	☐	☐	☐ Not accessible ☐ With Standard car X Requires 4-Wheel Drive
Access during heavy rains	x	☐	☐	☐ Not accessible ☐ With Standard car X Requires 4-Wheel Drive
Access when spillway is flowing	x	☐	☐	☐ Not accessible ☐ With Standard car X Requires 4-Wheel Drive
Other Studies Conducted	☐	☐	☐	☐ Phase I ☐ Phase II ☐ Hydraulics ☐ Stability ☐ Hazard ☐ Seismic ☐ Other:
Incident History	☐	☐	☐	☐ Breached ☐ Overtop ☐ Slide ☐ Down stream Flooding ☐ Other:
Reservoir's Current Use	☐	☐	☐	☐ Sediment X Irrigation ☐ Recreation ☐ Flood Control X Drinking Water ☐ Power Generation ☐ Other:

Findings and Corrective Actions:

- ☐ a. The Owner shall maintain documentations including Construction plans, specifications, improvements, modifications, Operations and Maintenance Manuals and routine inspection logs for this dam facility.
- ☐ b. An Emergency Action Plan (EAP) is on file with the department, submit any updates as applicable.
- ☐ c. An EAP is required for High Hazard Dams. Submit an updated EAP for this facility.
- ☐ d. An EAP is recommended for all dams regardless of hazard class. Submit EAP if developed for the facility.
- ☐ e. Submit narrative and additional information detailing the improvements, modifications, and/or alterations at the dam site, unless covered by approved dam permit.
- ☐ f. Routine inspection logs were not inspected.
- ☐ g. Dam owners shall provide for routine inspection of the dam.
- ☐ h. The dam did not appear to be maintained on a regular basis.
- ☐ i. Access to site appears to be satisfactory.
- ☐ j. There is no vehicular access to the dam site. Operational and emergency plans need to reflect this deficiency or access provided.
- ☐ k. Access to dam is questionable during severe weather conditions and/or spillway overflows. Operational plans and emergency plans need to reflect this deficiency or access provided.
- ☐ l. Provide a detailed narrative of the incident, responses taken, and any damages incurred. Dam owners are required to promptly advise the department of any sudden or unprecedented flood or unusual or alarming circumstance or occurrences which may adversely affect the dam or reservoir.
- ☐ m. Submit current Operations and Maintenance Manual or Procedures for this dam / reservoir facility.
- ☐ n. Submit Site or Facility Map of this Dam which identifies the location of major features including outlet works controls and conduits.
- ☐ o. _____

Additional Requirements:

The following investigative study(s) are:

Required	Recommended	
☐	☐	Phase I Study
☐	☐	Phase II Study (Including ☐ Seepage ☐ Hydrology/Hydraulics ☐ EAP)
☐	☐	Hydrology and Hydraulics (including Probable Maximum Flood and spillway capacity)
☐	☐	Stability Analysis
☐	☐	Seismic Analysis
☐	☐	Hazard Classification
☐	☐	Other: _____

Physical Dam Features: (Check All Applicable. Provide description of Items Observed and/or Take Photos. Indicate photo # in description.)

3. Reservoir:

Level during inspection 41 ft per _____ (gage / other) (Max 45' last week)

Normal Operating Level/Range 40 ft per _____ (gage / other)

Description: _____

Typical Operation ☐ Spillway always flowing x Kept within normal range ☐ Kept Empty ☐ Drained Daily ☐ Only filled by Storms

☐ Other: _____

Sinkhole in Res.: ☐ # Observed: _____ Size: _____ by _____ in. Deep ☐ Not Visible ☐ None Observed

Description: _____

Staff Gage: Description: _____

Findings:

x a. The reservoir was not inspected.

☐ b. The reservoir appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ c. The reservoir appeared to be in fair to poor condition and requires corrective action.

☐ d. The reservoir appeared to be in unsatisfactory condition, urgent corrective action is required.

Corrective Actions:

☐ e. The staff gage needs maintenance and/or repair. Description: _____

☐ f. A staff gage was not observed at the reservoir. Provide some method of quantifying the water level within the reservoir.

☐ g. A sinkhole was observed in the upstream reservoir. Conduct additional investigations and monitoring to identify the cause, risk and appropriate action.

☐ h. _____

4. Intake Works Description:

☐ Number of Intakes _____

☐ Intake Culvert / Pipe

Size: _____ in. ☐ DIP ☐ Corrugated Metal ☐ PVC ☐ HDPE ☐ Concrete ☐ Other _____

Control: ☐ Gate ☐ Valve ☐ Flow can either be Shut off or Bypassed

From: ☐ Stream Diversion ☐ Pump ☐ Reservoir ☐ Other _____

☐ Ditch / Flume

Dimension: _____ (Size x Depth) Shape _____

Surface: ☐ Dirt ☐ Wood ☐ Concrete ☐ Lined w/ _____

Control: ☐ Gate ☐ Valve ☐ Flow can either be Shut off or Bypassed

From: ☐ Stream Diversion ☐ Pump ☐ Reservoir ☐ Other _____

Findings:

x a. The intake works were not inspected.

☐ b. The intake works were not tested.

☐ c. The intake works appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ d. The intake works appeared to be in fair to poor condition and requires corrective action.

☐ e. The intake works appeared to be in unsatisfactory condition, urgent corrective action is required.

Corrective Actions:

☐ f. The intake works needs maintenance and/or repair. Description: _____

☐ g. _____

5. Upstream Slope: **(Typical Slope ± 1 : 2)**

Slope Protection: x None ☐ Dumped Rock ☐ Fitted Rip Rap ☐ Grouted Rip Rap ☐ Liner _____ ☐ Other: _____

☐ Defect in Protection: Description: _____

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") X Gully (>6" deep) ☐ Not Visible ☐ None Observed

Description: Minor benching on the slope.

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible x None Observed

Description: _____

Sinkholes: ☐ # Observed: _____ Size: _____ and _____ Depth ☐ Not Visible x None Observed

Description: _____

Vegetation: ☐ None ☐ Low Ground Cover x Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: Too much vegetation; difficult to inspect; clear vegetation.

Findings:

☐ a. The upstream slope was not inspected.

☐ b. The upstream slope appeared to be in satisfactory condition, no corrective actions are required at this time.

x c. The upstream slope appeared to be in fair to poor condition and requires corrective action.

☐ d. The upstream slope appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Slope protection needs maintenance or repair. Description:_____

☐ f. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description:_____

☐ g. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.

☐ h. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.

x i. The upstream slope was difficult to inspect due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

☐ j. Tree(s) were observed on the dam embankment. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.

☐ k. _____

6. Crest: Approximate Crest Width: **20'**

Access: ☐ None ☐ Walking Path x Roadway, Surface / Width / Usage: Dirt road

Erosion: ☐ Loose soil w/ little vegetation X Rut (<6") ☐ Gully (>6" deep) ☐ Not Visible ☐ None Observed

Description: Minor ruts on crest.

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible x None Observed

Description: _____

Sinkholes: ☐ _____ in. Wide x _____ in. Long x _____ in. Deep ☐ Not Visible x None Observed

Description: _____

Vegetation: x None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: _____

Findings:

☐ a. The dam crest was not inspected.

x b. The dam crest appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ c. The dam crest appeared to be in fair to poor condition and requires corrective action.

☐ d. The dam crest appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Access along the crest was satisfactory.

☐ f. Access along the crest was not possible. Description:_____

☐ g. Rut and/or Gully erosion was observed on the crest, which requires maintenance and/or repair. Description:_____

☐ h. A crack was observed on the crest, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.

☐ i. A sinkhole was observed on the crest, which requires further investigation to determine the underlining cause. Repair and monitor the area.

☐ j. Portions of the crest were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

☐ k. Tree(s) were observed along the dam crest. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.

☐ l. _____

7. Downstream Slope: **(Typical Slope ± 1 : 1. 5)**

Access: ☐ lower roadway along toe ☐ roadway to outlet works ☐ walkway to outlet works x None Observed

Slope Protection: x None ☐ Dumped Rock ☐ Rip Rap ☐ Grouted Rip Rap ☐ Concrete

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☐ Gully (>6" deep) x Not Visible ☐ None Observed

Description: _____

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible x Not Visible ☐ None Observed

Description: _____

Sinkholes: ☐ _____ in. Wide x _____ in. Long x _____ in. Deep x Not Visible ☐ None Observed

Description: _____

Vegetation: ☐ None ☐ Low Ground Cover x Bushes or Tall Grass x Trees # lots ☐ <6" x >6" & <20" ☐ >20"

Description: Too much vegetation; difficult to inspect; vegetation should be removed.

Seepage: Seep Spot Number 1 Right Dam

☐ Green Vegetation X Wet or Muddy Ground ☐ Ponding Water ☐Not Visible ☐ None Observed

☐ Flowing, Description: Observed wet soil on downstream slope of the right dam above valley floor. The seepage was flowing out of boulders placed against the toe.

Water Clarity: X Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Seep Spot Number 2

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible ☐ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

☐ a. The downstream slope was not inspected.

☐ b. The downstream slope appeared to be in satisfactory condition, no corrective actions are required at this time.

x c. The downstream slope appeared to be in fair to poor condition and requires corrective action.

☐ d. The downstream slope appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Slope protection needs maintenance or repair. Description: _____

☐ f. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: _____

☐ g. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.

☐ h. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.

x i. The down stream slope was very difficult to inspect due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

x g. Tree(s) were observed on the downstream slope. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.

x h. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition. Seepage on right dam above rock wall.

☐ i. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.

☐ j. The slope was very steep, around a 1 to 1 slope, further study is required to verify slope stability.

☐ k. _____

8. Abutments/Toe:

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☐ Gully (>6" deep) x Not Visible ☐ None Observed

Description: _____

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible x Not Visible ☐ None Observed

Description: _____

Vegetation: ☐ None ☐ Low Ground Cover x Bushes or Tall Grass x Trees #_____ X <6" X >6" & <20" ☐ >20"

Description: Difficult to inspect the abutments due to vegetation

Seepage: Seep Spot Number 1 **Left Dam**

☐ Green Vegetation X Wet or Muddy Ground X Ponding Water ☐ Not Visible ☐ None Observed

X Flowing, Description: _____

Water Clarity: X Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: Left dam: All seepage was clear. Light seepage observed on left abutment. Seepage was not an imminent threat to the dam. Moderate seepage along the valley bottom. Seepage was clear and posed no imminent threat. Monitor seepage. Remove thick vegetation on valley bottom to aid inspection. Light seepage observed on the right abutment

Seep Spot Number 2 **Right Dam**

☐ Green Vegetation X Wet or Muddy Ground X Ponding Water ☐ Not Visible ☐ None Observed

X Flowing, Description: approximately 50 gpm flowing in ditch leading away from dam

Water Clarity: X Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: Right Dam: Light seepage on left & right abutments. Moderate seepage in valley bottom. Seepage flowing out of boulders placed at the toe of the dam. Monitor seepage. Owner should have a seepage analysis conducted.

Findings:

☐ a. The abutments/toe were not inspected.

☐ b. The abutments/toe appeared to be in satisfactory condition, no corrective actions are required at this time.

x c. The abutments/toe appeared to be in fair to poor condition and requires corrective action.

☐ d. The abutments/toe appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Slope protection needs maintenance or repair. Description:_____

☐ f. Rut and/or Gully erosion was observed, which requires maintenance and/or repair. Description:_____

☐ g. A crack was observed along the abutments/near the toe, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.

x h. The abutment/toe area was very difficult to inspect due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

x i. Tree(s) were observed along the abutment/toe. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.

X *j. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.

☐ k. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.

☐ l. _____

9. Outlet Works:

Culvert / Pipe

Type / Size: _____

Culvert: ☐ Concrete ☐ Masonry ☐ unlined earth x Other Unsure

Pipe: ☐ DIP ☐ Corrugated Metal ☐ PVC ☐ HDPE ☐ Concrete ☐ Other _____

Control Type: x Gate ☐ Valve ☐ Other _____

Location: x Control on Upstream side ☐ Control on Downstream side

Seepage: ☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible x None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

☐ a. The outlet works were not inspected.

☐ b. The outlet works were not tested.

x c. The outlet works appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ d. The outlet works appeared to be in fair to poor condition and requires corrective action.

☐ e. The outlet works appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ f. Seepage/Ponding water was observed. Conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.

☐ g. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area. Failures caused by seepage/piping along the outlet conduit are very common and are considered to be a dangerous situation.

☐ h. Were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

☐ i. Tree(s) were observed on the dam embankment. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2” diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.

☐ j. _____

10. Spillway:

Type: ☐ None ☐ Culvert/Pipe x Channel

Description: Unlined spillway; spillway is located at a low spot on the left abutment.

Dimension: 100' ft. Invert elevation: _____ ft. per staff gage

Slope Protection: x None ☐ Grass ☐ Dumped Rock ☐ Fitted Rip Rap ☐ Grouted Rip Rap ☐ Concrete

☐ Defect in Protection: Description: _____

Approach: x Clear ☐ High Veg. ☐ Trees ☐ Other: Approach channel clear

Erosion: ☐ Scour ☐ Gully ☐ Headcut x Not Observed ☐ Other: _____

Description: _____

Vegetation: x None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: _____

Findings:

x a. The Spillway appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ b. The Spillway appeared to be in fair to poor condition and requires corrective action.

☐ c. The Spillway appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ d. Slope protection needs maintenance or repair. Description: _____

☐ e. The spillway approach was blocked. Clear approach.

☐ f. Severe scour erosion was observed which requires maintenance and/or repair.
Description: _____

☐ g. A headcut was observed downstream of the spillway. Corrective / mitigative action is required to prevent this problem from moving upstream.

☐ h. Trees are unacceptable in the spillway channel and approach. Take corrective action to address the woody vegetation problem and repair the damaged area.

☐ i. Unclear if spillway is adequately sized. Spillway should pass the probable maximum flood. Verify spillway capacity and take corrective action as required.

☐ j. _____

11. Down Stream Channel:

Name: _____

Downstream: ☐ Sump ☐ Open Area ☐ Un-Defined Drainage-way ☐ Defined Drainage-way ☐ Other _____

Items along Stream Bank: ☐ None ☐ Road ☐ Houses ☐ Town ☐ Not Inspected

Description: _____

Findings:

x a. The downstream channel was not inspected.

☐ b. The downstream channel appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ c. The downstream channel appeared to be in fair to poor condition and requires corrective action.

☐ d. The downstream channel appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. _____

Additional Comments: Two dams are located at the site. The dams are designated in this inspection report as the left and right dams.

FINDINGS:

Conclusion: On the date of this limited visual inspection, there appeared to be no immediate threat to the safety of the dam. No assurance can be made regarding the dam's condition after this date. Subsequent adverse weather and other factors may affect the dam's condition.

Short term recommendations: Routinely monitor seepage at both dams. Monitor the seepage on the left abutment, valley floor, and right abutment on both dams.

Long term recommendations:

1. The upstream and downstream slopes of the embankment should be clear and visible for inspection. Underbrush should be cleared and grasses kept short. Trees have been allowed to grow so large in some cases that there is concern that seepage along the root systems may develop. There is additional concern that cutting and killing the trees will lead to rotten roots and greater potential for seepage. A more in depth evaluation of the vegetation conditions should be performed to determine how best to remediate the condition.

2. A path or roadway along the groins, toe, and to the outlet works should be cleared and maintained to facilitate periodic inspection, maintenance, and monitoring of seepage conditions.

3. Seepage was observed along the downstream toe of both dams on the abutments and valley floor. The rate of seepage should be measured with a V-notch weir or Parshall flume. The rate of seepage should be measured with respect to the reservoir pool elevation.

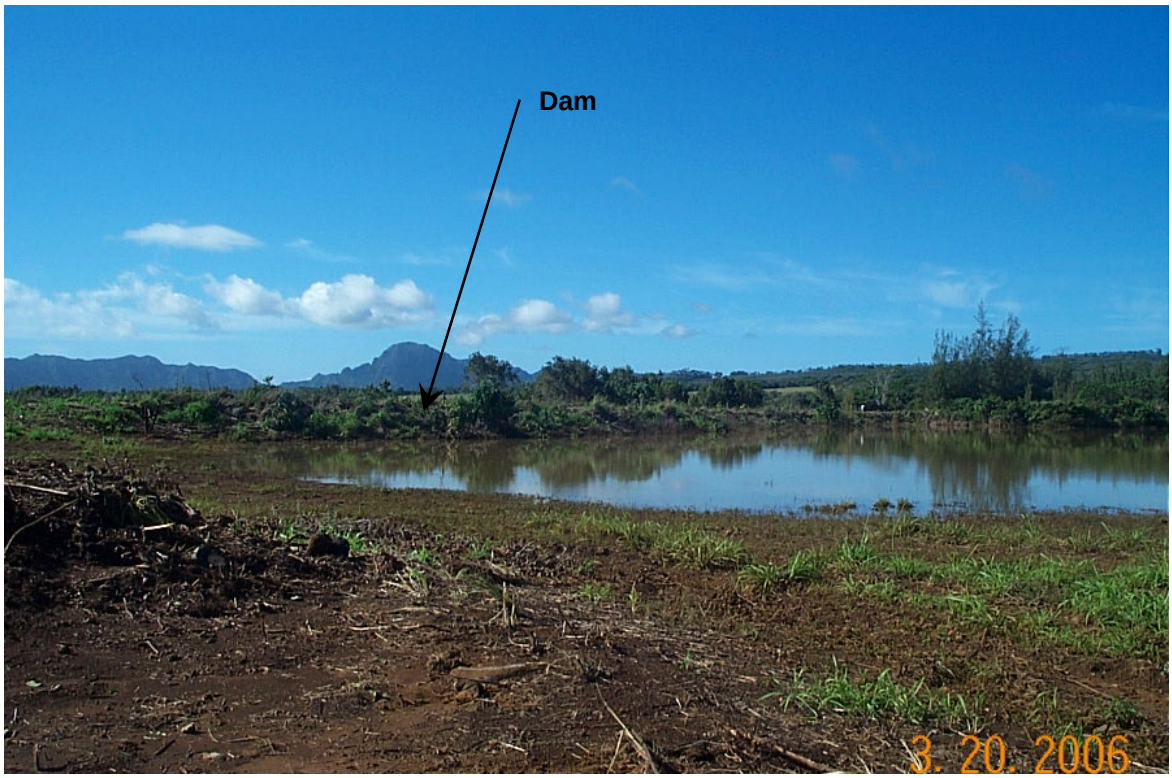
4. A seepage study should be conducted by a geotechnical engineer to determine the stability of the dam with regards to seepage in the foundation and through the dam.

5. The upstream and downstream slopes of the embankment are very steep (steeper than 1V:2H). The stability of the slopes should be further evaluated. If the factor of safety against sliding is less than the required factor of safety, flattening of the slopes or construction of a stability berm will be required. The upper 10 feet of the downstream slope is very steep and impossible to traverse. This section of the slope should be reshaped to aid access from the crest to the slope.

Limitations and Intent of this Dam Safety Inspection:

This Dam Safety Inspection was conducted to assess the general overall condition of the reservoir/dam, identify visible deficiencies, and recommend areas of for monitoring, additional investigative studies and corrective actions. The inspection is based only on visible features/areas of the dam on the day of inspection. This inspection is not a formal phase I or phase II dam safety inspection and does not include a review or evaluation from each specialist of an inspection team, such as a geologists, civil, geotechnical, structural, or hydraulics engineer. The owner should verify the findings of this report and take corrective actions. The owner may submit to the State alternative corrective actions that are certified by a licensed professional engineer in the State of Hawaii experienced in the design and construction of dams. This inspection does not relieve the owner/operator from their responsibility to conduct routine inspections, maintenance, repairs, modifications, monitoring, documentation, and/or investigative studies. The inspection was conducted under the authority of the Hawaii Revised Statures Chapter 179D, and Hawaii Administrative Rules, Title 13, Chapter 190, titled "Dams and Reservoirs". Questions regarding this inspection should be forwarded to the Hawaii State Dam Safety Program; PO Box 373; Honolulu, Hawaii 96809; Ph. (808) 587-0236.

HI00012 - Kapaia Reservoir: View of downstream slope and crest of the left dam. Note vegetation on downstream slope.



HI00012 - Kapaia Reservoir: Upstream slope of dam of the left dam.

HI00012 - Kapaia Reservoir: Downstream slope of the left dam. Note dense vegetation on slope.

HI00012 - Kapaia Reservoir: Downstream slope of the right dam.